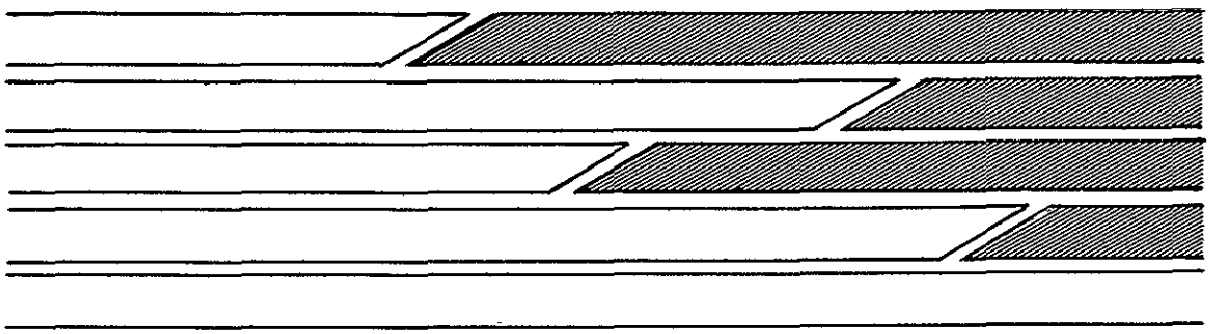
RESEARCH AND TECHNICAL ASSISTANCE PROGRAMS IN AGRICULTURE AND FISHERIES



Fiscal Year 1970 - 1971

Department of State
Agency for International Development
Washington, D.C.

RESEARCH AND TECHNICAL ASSISTANCE PROGRAMS

IN

AGRICULTURE AND FISHERIES

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Fiscal Year 1970-1971

Sponsored by the
Office of Agriculture and Fisheries
Technical Assistance Bureau

DEPARTMENT OF STATE

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

Washington, D.C.

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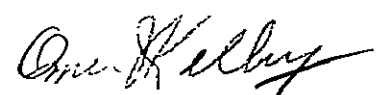
FOREWORD

In recent years the Agency for International Development of the Department of State has significantly expanded its research and technical assistance programs in the field of agriculture. This expansion has mirrored the new primacy gained by agriculture in economic development, as concern mounted over the growing imbalance between world population and available food resources. It was also due in part to the recognized need for a multidisciplinary, coordinated attack upon the complex of deep-rooted agricultural problems afflicting the developing nations.

Brief summaries of A.I.D.'s major centrally-funded agricultural research and technical assistance projects are given in the following pages. Grouped by subject categories are capsule descriptions of specific projects dealing with problems of production, processing and marketing of field crops, special crops, fisheries, livestock, water, soils, seeds, fertilizers, pesticides, land use and tenure, and agricultural policy. Finally, there is a list of institutional grants for which this office exercises technical responsibility—the so-called "211(d) grants" designed to strengthen the capability of U.S. educational and research institutions to deal with critical social and economic problems of the less developed nations, and with their needs in the biological and physical sciences.

These projects are in various stages of operation or development. Most are current, ongoing; a few are in the planning stage; some are either nearing completion or have already been completed. The latter are included because the data and recommendations developed by the researchers are of continuing value to agricultural scientists, government officials, and others dedicated to helping the peoples of the developing lands build a better life.

The research and technical assistance projects described in this volume originated over the past decade (1960-1970). Recognition is given to the former and present members of this Office who participated in the development of this program. Acknowledgement is also made of contributions by members of the A.I.D. Regional Bureaus, those of other agencies and the scientific community.



Omer J. Kelley, Director
Office of Agriculture and Fisheries
Bureau for Technical Assistance
Agency for International Development

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THE ROLE OF THE OFFICE OF AGRICULTURE AND FISHERIES IN RESEARCH AND TECHNICAL ASSISTANCE

I. *OBJECTIVES*

The research and technical assistance objectives of the Office of Agriculture and Fisheries (AGF) are: to identify biological, physical, economic, and social and policy constraints impeding agricultural development, assigning to these constraints orders of priority for use of A.I.D.'s resources; to develop programs where known technologies can be made available for application to local problems; to formulate programs of research in the development of new technology and devise means of utilizing this technology for overcoming these constraints; and to assist the Less-Developed Countries (LDCs) in the adoption of research findings and in the development of indigenous research competence. These objectives serve recognized needs of increasing agricultural food production and productivity, of improving the dietary qualities of foods, and of increasing farm incomes and rural employment opportunities.

II. *INSTITUTIONAL DEVELOPMENT*

In the long term, AGF plans to contribute to developing research competence in the LDCs through advanced training of local people in agricultural sciences and through assistance in the development of local research institutions. Where feasible, training and institutional development components are incorporated into programs of technical assistance and research.

In connection with the development of research competence in the LDCs and with research programs in food, AGF is cooperating in an international goal to develop worldwide networks of highly competent research institutions which focus on key needs, particularly in the areas of high protein crops, livestock, water, and tropical soil management.

The development of worldwide research networks is complementary to the goal of increasing research competence in LDCs in order to link institutions of developed countries to those of LDCs.

III. *APPLICATION OF RESULTS*

It is an AGF responsibility to identify means of promoting the application of research findings in the agricultural development programs of the LDCs. In this respect, AGF serves as intermediary, coordinator, catalyst, and consultant for research institutions, A.I.D. regional bureaus, missions, and host governments.

IV. *STRATEGY*

To carry out its functions in research and technical assistance, AGF mobilizes U.S. scientific talent and competent institutions. Services of U.S. Land-Grant colleges and universities and other organizations are contracted to work with A.I.D. in the

U.S. and overseas in all the disciplines affecting agricultural development, including the biological sciences, physical sciences, agricultural economics and other social sciences. Their capabilities are concentrated on key problem areas of agricultural development.

In its program of mobilizing outstanding U.S. scientific talents, AGF engages consultants to form "critical masses" of multidisciplines for the purpose of identifying research and technical needs, formulating and evaluating programs, and selecting ways of applying results and technical services.

AGF also identifies requirements for additional U.S. competence in overseas needs, and formulates programs under the 211(d)-grant legislation to develop the desired competency. Measures are sought to build effective and lasting links between U.S. and LDC institutions in these programs.

In developing worldwide research networks, AGF works with international and bilateral agencies and international foundations engaged in overseas research and assistance.

A. CROP AND SEED IMPROVEMENT AND ANIMAL PROTEIN

Research

PROJECT NUMBER: A-1 (Started: 4/16/1963. Projected termination: 6/30/1973.)

TITLE: Development and Use of Improved Varieties of the Major Cereal Crops in Africa

CONTRACTOR: Agricultural Research Service, U.S. Department of Agriculture

PROBLEM: Maize, sorghum, and millet are the major cereal crops in Africa. Economic progress requires a substantial increase in food production, which will only be possible with varietal improvement, disease and insect control, and development of adequate cultural and management practices in the cultivation of the major crops.

OBJECTIVES: The broad objectives of this project are to: (1) Cooperate with existing programs and initiate new breeding programs for the development of improved varieties or hybrids of sorghum, millet, and maize; (2) develop control measures for the principal diseases which affect these crops; (3) identify and determine the geographical distribution and severity of the principal insect pests; (4) determine soil management factors which will contribute toward maximum production of the three crops.

PLAN OF WORK: Two main research centers were established -- at Ahmadu Bello University, Zaria, Nigeria, in West Africa, and at the Government Experiment Station, Serere, Uganda, in East Africa. Satellite stations for maize were located at Ibadan, Nigeria, and Kitale, Kenya. In order to extend the research results to additional countries, the Africa Bureau has exercised responsibility for this project since July 1, 1969.

RESULTS: High-yield maize varieties have been developed at Kitale and are now in wide use by farmers throughout the East African region. In West Africa, resistant lines of sorghum have been found for specific diseases and major insect pests. Samaru Hybrid No. 1, which has increased sorghum yields four-fold, has been released for commercial production. The maize-breeding program at Ibadan has produced composites and strains now under test in 10 countries. The opaque-2 gene, which improves the protein content of maize, is being incorporated into locally adapted varieties.

PROJECT NUMBER: A-2 (Started: 6/30/1966. Projected termination: 6/29/1971.)

TITLE: Inheritance and Improvement of Protein Quality and Content in *Sorghum Vulgare* Pers.

CONTRACTOR: Purdue University

PROBLEM: Sorghum is widely used in Asia and Africa as a food crop and in Latin America as a feed grain. It is primarily an energy foodstuff and, like wheat and corn, is low in total protein. Research data indicate wide hereditary variation between races and strains of sorghum in total protein and also in certain essential amino acids. The development of varieties and/or hybrids that are both high-yielding and high in content and quality of protein constitutes a practical goal, the achievement of which would be a significant contribution to better diets for people using sorghum as a major foodstuff.

OBJECTIVES: To survey collections of sorghum so as to identify strains with superior protein characteristics. The resulting materials will be cross-bred to produce high-yielding, high-quality varieties for use by sorghum breeders in the less-developed countries.

PLAN OF WORK: Hybrids produced at Purdue are tested for at least two years to determine productivity and quality. Field nurseries are grown at Purdue. A winter nursery is grown in Puerto Rico each year to propagate strains not suited to the day-length in Indiana, and also to produce a second generation of promising lines in the same year. Promising materials are sent to interested countries for use in local breeding programs.

RESULTS: About 3,000 lines of the world collection have been screened for protein and lysine, day-length response and general yield performance, and seed characteristics. Intercrosses have been made at Purdue and other locations, and inbred derivatives from these have been selected and assessed for yields, protein, and amino acid composition. The project has demonstrated that protein levels in sorghum can be raised significantly and the limiting amino acids -- including lysine, threonine, tryptophan, and cystine -- appreciably increased at the same time. The project worked with 61 major cooperators in 31 countries through 1969.

PROJECT NUMBER: A-3 (Started: 6/28/1965. Projected termination: 6/27/1972.)

TITLE: Farm and Equipment Power Requirements for the Production of Rice and Associated Food Crops

CONTRACTOR: International Rice Research Institute, Los Banos, Philippines

PROBLEM: Basic to increased farm production and more intensive cropping is a reliable source of power, other than human and animal, at a cost that small farmers can afford. Animal and human power on rice farms in the Far East and other regions is generally inadequate for continuous and/or multiple cropping. The introduction of improved varieties also increases the machinery requirement for soil preparation, cultivation, harvesting, threshing, and drying.

OBJECTIVES: To conduct applied research on the major paddy mechanization problems and assist in the development of new and improved rice machinery, suitable for small farms in paddy rice cultivation in Asia; the goal is to develop simple machinery for tropical paddy cultivation within the manufacturing capability of the developing countries.

PLAN OF WORK: Power equipment of various sizes and types is being developed and tested under field conditions. Cost and technical comparisons are established to obtain reliable estimates of economic efficiency. The economic comparisons include determination of size and shape of fields for maximum efficiency in cropping, soil and water management, and power use. Once equipment has been developed, tested, and found satisfactory, plans and specifications are made available to manufacturers.

RESULTS: A prototype thresher, simple in design and technically efficient, has been completed and is already being manufactured by three local firms in the Philippines. A table-type power thresher which can be conveniently carried by four persons has been built and tested. Prototypes of machines for harvesting, drying, and seed cleaning have been constructed and are undergoing testing and adaptation. A push-type of rotary portable weeder produced by this project can weed one hectare in 20 hours -- one-sixth the time required to weed the same area by hand.

PROJECT NUMBER: A-4 (Started: 6/29/1966. Projected termination: 6/28/1971.)

TITLE: Improvement of Nutritional Quality of Wheat Through Increased Protein Content and Improved Amino Acid Balance

CONTRACTOR: University of Nebraska

PROBLEM: Diets of the people in the less-developed countries are usually deficient in protein. The need exists for improving the nutritional value of the wheat produced in the LDCs by increasing protein content and improving the amino acid balance of the breeding stocks, and by incorporating these lines in the varieties used by farmers.

OBJECTIVE: To improve the nutritional value of the wheats produced in the LDCs.

PLAN OF WORK: The contractor is: (1) completing protein-lysine screening of the 15,000 items in the U. S. Department of Agriculture World Wheat Collection; (2) analyzing approximately 4,000 samples per year from environmental nurseries in the U. S. and the International Winter Wheat Nursery; (3) analyzing and segregating populations from crosses to identify high-protein, high-lysine segregates; (4) obtaining complete amino acid profiles on selected high-protein, high-lysine wheats from the international nurseries; (5) making additional crosses of high-protein and high-lysine wheats with commercially acceptable wheats from developing countries and analyzing selected crosses for protein to identify new genetic sources of high protein; (6) making available promising high-protein, high-lysine lines to other agencies and developing countries.

RESULTS: The project has been reviewed in the field and the reports are very favorable. International Wheat Performance Nurseries have been established in 26 countries to evaluate performance of 30 varieties and new selections under different conditions with respect to yields and protein quality. New selections are being made in segregating progenies and promising hybrids, with initial field testing of winter types in Nebraska and of spring types in Mexico. All data relating to protein and amino acid composition of wheats analyzed by the contractor are put on punch cards and print-out sheets and made available to all cooperators in other countries, the International Maize and Wheat Improvement Center of the Rockefeller Foundation, and other interested organizations.

Research (Continued)

PROJECT NUMBER: A-5 (Started: 6/25/1963. Projected termination: 6/30/1972.)

TITLE: Improvement of Grain Legume Production in the Near East, South Asia, East Asia and Africa regions

CONTRACTOR: U. S. Department of Agriculture

PROBLEM: In areas where meat is prohibitively expensive for all but the rich or not eaten because of religious taboos, protein requirements can best be supplied by additional consumption of edible grain legumes. A precondition for additional consumption is increased production of those crops. At present, production of grain legumes in some areas is low because of poor-yielding varieties; lack of fertilizers; poor crop, soil and water management policies, and inadequate control of insects and diseases.

OBJECTIVE: To increase the yields, reduce production costs, and enhance the quality of major grain legumes, especially pulses (beans and peas), which are often the sole source of high-quality protein in many Asian and African countries.

PLAN OF WORK: Two regional centers were established, in Iran and India, for research on plant breeding, pathology, entomology, and soil and crop management. Training of nationals is being accomplished by having trainees work with the staff.

RESULTS: The research teams have completed a fourth season in Iran and a third season in India. Significant results include: (1) Identification of varieties of chick-peas that yield more than local varieties; (2) identification of chickpea materials resistant to several of the major insect pests; (3) selection of varieties of mung beans that significantly surpass yields of local varieties; (4) development of improved cultural practices which have resulted in more than doubling the yields of local varieties; (5) assembling a collection of at least 10,000 varieties and selections from all parts of the world for evaluation of yield potential, protein content, and insect and disease resistance. Centrally-funded A. I. D. support for the India-based part of the project ceased at the end of FY 1970. An "All India Pulse Improvement Project" will continue with support from the government of India and the A. I. D. country mission. A. I. D./W will continue to support limited project activities in Iran.

Research (Continued)

PROJECT NUMBER: A-6 (Started: 6/16/1969. Projected Termination: 9/15/1970.)

TITLE: Preparation of a Plan for Orientation of Research on Cassava *(Manihot esculenta)*

CONTRACTOR: University of Georgia

PROBLEM: The tubers of the cassava plant *(Manihot esculenta)* have long been used as a basic food crop by peoples of the tropical regions, particularly in Latin America and Africa -- and, to a lesser extent, in Asia. The root is one of the cheapest sources of carbohydrates for human food; in some areas it has also been used as an inexpensive livestock feed. It is easy to grow and adapted to a wide variety of soil types and climatic conditions. But diets consisting mainly of cassava are deficient because of the low protein content. The crop could become a more valuable source of food for humans and animals if new varieties could be developed which would increase yields and contain more protein.

OBJECTIVES: To compile on a systematic basis available information about cassava and seek to determine the crop's potential and limitations as a human and animal food.

PLAN OF WORK: A research team is reviewing the literature on cassava and gathering information on genetic characteristics, environmental adaptability, crop yields, cultural practices, chemical composition, comparative food value, insect and disease susceptibility, and resistance of the existing species, as well as harvesting and storage problems. A research plan is being prepared which will recommend priorities and specify areas in which further investigation is needed.

RESULTS: A team has visited several countries where cassava is a staple and conducted on-site research. Results will be known and evaluated later.

PROJECT NUMBER: A-7 (Started: 7/1/1970. Projected termination 6/30/1975.)

TITLE: Inheritance and Improvement of Protein Quality and Content in Maize

CONTRACTOR: Purdue University

PROBLEM: Cereal grains supply about half of all human protein needs. One of the major cereals is maize, a food crop low in protein content and quality. Because of these deficiencies, the diets of peoples heavily dependent on maize as a staple food fall short of acceptable standards of good nutrition. Genetic research with other major cereals -- wheat, sorghum, rice -- indicate that protein content and quality are controlled by specific genes and can be transmitted by incorporating those genes into conventional varieties. Discovery of genes which would improve protein quality and content in maize without unfavorably affecting yield would represent a major breakthrough for improved human and animal nutrition.

OBJECTIVES: This project aims to evaluate promising germ plasm from the world maize collection in quest of additional genes which would boost protein quality and quantity. It will also assist in the creation of a worldwide system for maize improvement and in the rapid dissemination of research findings among cooperators.

PLAN OF WORK: Research under this project will be closely coordinated with that being conducted by other organizations -- government agencies, universities, foundations, commercial seed companies, etc. -- in order to obviate duplication or overlap. Purdue is a center for research in plant genetics, with supporting personnel and facilities. A central biochemical laboratory will be established at the university where strains from the world maize collection will be systematically assayed for protein content and also for lysine and tryptophan, essential amino acids now missing in conventional varieties. Most of the research involves breeding and genetic studies -- work which is inherently long-term in nature. It is expected that full accomplishment of the objectives may require five years or more.

RESULTS: This is a new project. It is too early to evaluate results.

PROJECT NUMBER: A-8 (Started: 3/30/1969. Projected termination: 10/31/1971.)

TITLE: Survey and Analysis of the Problem of Cattle-Feeding Systems and Nutrition in the Wet/Dry Tropics of Latin America

CONTRACTOR: University of Florida

PROBLEM: The problem of cattle production in the wet-dry tropics is largely one of providing a high level of nutrition throughout the year. There is a need to know more about feed crops which, when combined with supplements such as urea, will provide nutritious, low-cost feed.

OBJECTIVE: To develop a data base for a feeding project which would be expected to significantly increase the potential animal protein production of tropical countries.

PLAN OF WORK: Because of the specific interest and experience of the University of Florida, the study of feeding systems is being limited to the lowlands (below 5,000 feet) of the wet/dry and humid tropics. The inquiry was initiated in Latin America and will be extended to other areas as research progresses. The method of procedure for pooling the information on livestock feeding systems in Latin America is as follows: (a) review reports of A.I.D., Food and Agriculture Organization, Organization of American States, and the agricultural attaches of the countries involved; (b) review available technical literature; (c) review theses for related materials; (d) prepare a questionnaire for research data on the basis of material reviewed; (e) conduct a field survey by staff members from the University's appropriate faculties (Animal Science, Dairy Science, Poultry Science, Plant Science, and Agricultural Economics); (f) prepare a synthesis of the material gathered, and (g) prepare an economic evaluation of the practices related to costs, income production levels, etc., in order to determine relative returns at present levels.

RESULTS: Work is in progress. It is too early to evaluate results.

Research (Continued)

PROJECT NUMBER: A-9 (Started: 6/30/1966. Completion date: 12/31/1968.)

TITLE: Technical and Economic Factors Associated with Establishment of a Seed Industry in the Less Developed Countries

CONTRACTOR: Mississippi State University

PROBLEM: An assured supply of high quality seeds is an essential requirement for increased agricultural production. In most of the developed countries this input is dispensed to farmers by efficient, privately-owned seed companies. In many of the less developed countries the situation is far different; there are numerous and diverse obstacles to be surmounted in establishing a viable seed enterprise in the private sector.. To shed light on these problems and add to the store of information on the subject, MSU was commissioned to make an in-depth study of conditions necessary for developing an efficient and reliable privately-owned seed industry in the LDCs.

OBJECTIVES: To produce a handbook in which the data uncovered by the investigation will be summarized for the guidance of U.S. seed companies with overseas interests, agri-business groups, A.I.D., LDC governments, foundations, LDC seed companies, and other interested parties.

PLAN OF WORK: Interviews were conducted with representatives of U.S. seed companies on their experiences in the less developed countries. Teams from MSU visited the following countries and surveyed the technical, economic, and political factors affecting the development of a private seed industry: Ghana, Kenya, Tanzania, Colombia, Argentina, Brazil, Turkey, Pakistan, India, Thailand, Philippines, and Taiwan.

RESULTS: Completion of the handbook has been delayed, due to MSU's heavy commitment to AID under other contracts. A draft is presently in preparation.

PROJECT NUMBER: A-10 (Started: 9/1/1969. Projected termination: 6/30/1972.)

TITLE: Development of a Process for the Preparation of Coconut Protein Products for Use in Foods

CONTRACTOR: Texas A & M Research Foundation

PROBLEM: Coconuts are raised in many LDCs either for food or for processing into copra as an export commodity. For the most part, these are countries where the protein shortage and malnutrition are most acute; yet the bulk of the protein content of their coconut crop is either shipped abroad as copra or rendered unfit by processing for use other than as animal feed or fertilizer. Thus, according to FAO statistics, about 200 million pounds of coconut protein are exported annually from the Philippines as copra -- enough to provide 18 grams of protein per day for every inhabitant of the island-nation.

OBJECTIVE: To develop a commercially feasible process that will yield coconut protein products -- flour, concentrate, etc. -- in a form suitable for human consumption.

PLAN OF WORK: In September 1969 the Office of Agriculture and Fisheries funded a "pre-research" contract under which a team of Texas A & M scientists conducted a worldwide investigation of coconut processing methods to determine whether further research into the coconut's potential as a protein food source was justified. The team found that in no producing country was the full nutritional benefit of the coconut crop being realized. Further research was recommended into three possible ways of converting coconuts into a protein-rich foodstuff: (1) by pressing the oil from the meat, (2) by solvent extraction, and (3) by the "wet process" (bombarding the disintegrated meat with water to wash out the oil). On June 30, 1970, a contract to pursue research into these three methods was awarded to Texas A & M, and the operational responsibility was transferred to the Technical Assistance Bureau's Office of Nutrition.

RESULTS: Nothing to report yet from this new project.

Technical Assistance

PROJECT NUMBER: A-11 (Started: 3/25/1970. Projected termination: 9/25/1971.)

TITLE: Textbook on Natural Fiber Crops

CONTRACTOR: University of Florida

PROBLEM: A need exists for an authoritative book on natural vegetable fibers which will provide the latest, most complete information and serve as a textbook reference and research guide for the developing countries.

OBJECTIVE: To produce a textbook on the natural vegetable fibers.

PLAN OF WORK: The manuscript is being prepared by James Dempsey, a recognized authority on the subject. Some 100 fiber crops will be covered from every aspect, including history, botany, cultural methods, area adaptability, processing, grades, production economics, and utilization.

RESULTS: The manuscript will be submitted to A.I.D. on completion in June 1971. Upon approval, it will be published by the University of Florida Press.

PROJECT NUMBER: A-12 (Started: 3/18/1957. Projected termination: indefinite.)

TITLE: Seed Processing and Testing

CONTRACTOR: Mississippi State University

PROBLEM: Many of the less-developed countries need technical assistance and consultation in the field of seed processing and testing. The need is especially acute in such areas as: (1) organization of seed improvement programs; (2) identification and analysis of seed production; (3) processing and storage problems, and (4) advice on planning, design, and construction of physical facilities.

OBJECTIVE: To provide technical assistance to cooperating countries in seed improvement.

PLAN OF WORK: The assignment given Mississippi State University under this project is to set up seed improvement programs for designated LDCs and help train their nationals to operate the programs efficiently. The university provides the services of engineers, agronomists, seed processing specialists, geneticists, and plant production technicians in responding to requests for technical assistance from A.I.D. missions and cooperating countries. Members of the entire agricultural staff of the university are available for the project, and outside consultants are hired when required.

RESULTS: Design and specifications of facilities for seed programs have been provided to several countries. In Panama, for example, assistance and advice were provided on an accelerable seed program, including design of layout, installation of equipment, and training of technicians in operating procedures. Other types of services: Design and testing of low-cost walk-in germinators for LDCs; orientation and conferences with A.I.D.-sponsored visitors; seed improvement seminars for international participants, and the preparation of an illustrated handbook on "Seed Processing and Handling."

PROJECT NUMBER: A-13 (Started: 6/1/1955. Projected termination: Indefinite.)

TITLE: Plant and Seed Materials for the Development of Potential Crops in the Less-Developed Countries

CONTRACTOR: Agricultural Research Service, U.S. Department of Agriculture

PROBLEM: The low productivity of agriculture in most of the less-developed countries is directly related to the low-yield characteristics of many indigenous crop seeds and plant materials. By introducing improved material and germ plasm, it may be possible to speed up breeding programs and thereby stimulate agricultural production and productivity.

OBJECTIVE: To provide technical advisory services and experimental quantities of seed required for increasing the production of food, fodder, and fiber crops in the LDCs.

PLAN OF WORK: The contractor provides A.I.D. Missions with seeds of selected crops, recommends promising varieties, and assists by correspondence and visits to the field in assessing the needs of host countries for improved germ plasm material and related technical assistance.

RESULTS: High-quality, productive varieties developed in the U.S. and other agriculturally advanced countries have been directly established in a number of LDCs. In some instances, long-term breeding programs have not been required, thus giving an almost immediate boost to the economy, and in others the lead time has been materially shortened. Following are some specific examples of the project's beneficial results: In Brazil, Pangolagrass (A-24) is now widely accepted by farmers; with nitrogen application, it produced 447 pounds of beef per acre as compared to 208 for molassesgrass, in the first 168 days. In Paraguay, Unit-I Puerto Rico seed potato from the U.S. produces highest yields. Pecan, cork oak, Arizona cypress, and slash pine from the U.S. have been multiplying rapidly and have sharply spurred the country's reforestation program. In Ghana, two superior strains of kenaf from Florida are being used commercially for fiber. In Korea, the spectacular superiority of U.S. corn varieties and hybrids has been demonstrated and local technicians have been instructed in handling parent and crossing stock.

PROJECT NUMBER: A-14 (Started: 6/30/1967. Projected termination: 6/29/1972.)

TITLE: Technical Assistance in Food Grain Drying, Storage, Handling, and Transportation

CONTRACTOR: Kansas State University

PROBLEM: Many of the less-developed countries sustain serious losses of food grains and food grain quality during post-harvest handling, drying, and storage. They are in need of information on methods of environmental control and assistance in designing and constructing physical facilities for control of rodent, mold, microbial, and insect contamination.

OBJECTIVE: To furnish upon request technical assistance to A.I.D. and cooperating countries in solving problems involving the losses of food grains during post-harvest handling.

PLAN OF WORK: The contractor makes available personnel and facilities to provide: (1) technical assistance tailored to the need and material resources of each cooperating country; (2) assistance in identification and diagnosis of problems in grain drying, storage, conditioning, handling, and transportation in cooperating countries and recommend means of solution; (3) specialized grain drying, conditioning, storage, handling, and transportation training courses, seminars, or conferences for A.I.D. and cooperating country personnel; (4) information services to respond to questions and inquiries submitted, and (5) such other technical assistance as may be mutually agreed on by A.I.D. and Kansas State University.

RESULTS: To date the contractor has dispatched teams to Guyana, Ecuador, Guatemala, Dominican Republic, Jordan, Pakistan, India, Philippines, Honduras, Costa Rica, Morocco, Korea, and the Asian Productivity Organization in Tokyo. Fifteen published reports and several memorandum-type reports have been issued. A special group training course was conducted in July 1970 for 20 participants from Latin America. Similar courses will be repeated for other areas upon demand.

PROJECT NUMBER: A-15 (Started: 5/15/1968. Projected termination: Indefinite.)

TITLE: A Grant to Enable the International Rice Research Institute to Expand its Training and Consultant Services in the Far East, South Asia, Latin America, and Africa

CONTRACTOR: International Rice Research Institute (IRRI), Los Banos, Philippines

PROBLEM: The rapid spread of IRRI-developed high-yielding varieties of rice has resulted in more requests for training and technical assistance than IRRI can meet with its existing facilities and staff. Many of the requests for assistance come from countries in which A.I.D. is supporting major efforts to increase rice production.

OBJECTIVE: The purpose of the grant is to enable IRRI to meet the increased requests for training and consultant services.

PLAN OF WORK: IRRI's work encompasses all phases of rice research, training, and production.

RESULTS: The funds from this initial FY 1969 grant were used to purchase commodities, equipment, and services from U.S. sources in order to free other IRRI resources for the expansion of research, training, and technical assistance. Subsequent A.I.D. grants have been made under the East Asia Bureau.

PROJECT NUMBER: A-16 (Started: 1/16/1969. Projected termination: Indefinite.)

TITLE: A Grant to Enable the International Maize and Wheat Improvement Center to Expand its Research and Development Program

CONTRACTOR: International Maize and Wheat Improvement Center, Mexico City, D. F.

PROBLEM: The Center (known as CIMMYT, from its Spanish initials: Centro International de Mejoramiento de Maiz y Trigo) is an autonomous, non-profit, scientific, and educational institution sponsored jointly by the Rockefeller and Ford Foundations. It is conducting research, training, testing, and cooperative breeding programs with approximately 50 countries. A.I.D. provided $425,000 during FY 1969 and $525,000 during FY 1970 for expansion of the research and development program.

OBJECTIVES: The A.I.D. grants are to help extend the present wheat yield nurseries program, initiate a comparable maize nursery program, and establish a worldwide data retrieval analysis and interpretation office for all wheat and maize specialists.

PLAN OF WORK: At the Mexico City headquarters and four regional experimental farms in the world's principal tropical and sub-tropical ecological zones, CIMMYT's staff of scientists work on a wide range of maize and wheat studies. In addition, staff members are assigned to various other countries, making original crosses and testing the adaptability of plant material originally selected in Mexico.

RESULTS: New high-yield varieties of corn and wheat have been produced, tested in cooperating countries and released for commercial production. They are now being planted annually on over 13 million acres throughout the world. Technicians at the undergraduate, graduate, and post-doctoral levels from many countries have received specialized training at the Center. The high-yielding, disease-resistant varieties of wheat have sparked a revolution in wheat production in Mexico, India, Pakistan, and Turkey. CIMMYT's maize improvement program has also made a notable impact in various parts of the world.

PROJECT NUMBER: A-17 (Started: 6/30/1969. Projected termination: 12/30/1970.)

TITLE: A grant to enable the International Center for Tropical Agriculture to broaden the scope of its planned activities

CONTRACTOR: International Center for Tropical Agriculture, Cali, Colombia

PROBLEM: Known as CIAT (from the initials of its Spanish title: Centro Internacional de Agricultura Tropical), the center was organized and funded in 1968 by the Rockefeller, Ford, and Kellogg Foundations in collaboration with the government of Colombia. It is one of four international research and training institutions founded to help expand agricultural production in the developing world (the others are IRRI, in the Philippines; CIMMYT, in Mexico, and the International Institute of Tropical Agriculture, in Nigeria). In FY 1969 A.I.D. extended to CIAT a grant of $275,000 to supplement the contributions of the foundations and thus permit the center to undertake certain specific activities not provided for in its budget.

OBJECTIVES: To permit CIAT to conduct certain programs of special interest to A.I.D.

PLAN OF WORK: The A.I.D. grant was used primarily for: (1) expanding the number of post-graduate interns in training; (2) pilot studies of cassava varieties with a high protein content; (3) establishing a core program for plant protein, beginning with the collection and screening of varieties.

RESULTS: The project was transferred to the Latin American bureau in FY 1970.

PROJECT NUMBER: A-18 (Started: 4/9/1965. Projected termination: Indefinite.)

TITLE: Vanguard Program (International Cooperation Program of the Republic of China)

CONTRACTOR: Government of the Republic of China

PROBLEM: Since 1960 the Government of the Republic of China (GRC) has conducted a technical assistance program (called Vanguard) for other countries -- mainly in Africa. The accent has been on agriculture demonstration and extension projects, especially in the production of rice. But the program also involves other commodities, such as vegetables. In token of its success, the Chinese received many requests to expand the program. But they lacked sufficient financial resources, so they appealed to the U.S. for help. Under an agreement signed April 9, 1965, the remaining counterpart funds generated by the U.S. aid program to GRC from 1950 to 1965 were turned over to the Chinese and made available for technical cooperation with friendly nations among the LDCs. About two years later funds amounting to the equivalent of $18,750,000, resulting from the sale of PL 480 food in Taiwan, were turned over to GRC for its Vanguard program.

OBJECTIVE: Vanguard aims at helping increase food production in the LDCs.

PLAN OF WORK: GRC has dispatched teams of agricultural specialists to determine the needs of the cooperating countries; invited nationals of cooperating countries to visit Taiwan to observe agricultural development, and granted fellowships to technicians of friendly countries to attend seminars or receive on-the-job training in Taiwan.

RESULTS: Since 1962 over 400 agricultural technicians from Africa alone have received training under Vanguard. Some 800 Chinese technicians have been dispatched to more than 23 countries in Africa, Asia, and Latin America. In FY 1970, the project was transferred to A.I.D.'s East Asia Bureau.

B. SOILS AND FERTLIZERS

Research

PROJECT NUMBER: B-19 (Started: 6/25/1963. Completed: 6/30/1970.)

TITLE: Nutrient Status of Soils of Latin America

CONTRACTOR: North Carolina State University

PROBLEM: Annual fertilizer consumption in Latin America is expected to reach 5.4 million tons by 1980 -- almost six times the 1960 total. To manufacture these increased quantities will require a capital investment of more than $5 billion, while annual expenditures for fertilizers will run over $4.5 billion. It is vital to the economy of the countries involved that this money be invested in ways that will give the greatest return. Therefore, information must be gathered to ascertain geographic needs for kinds and amounts of fertilizers so that an efficient production and distribution system can be set up and farmers güided in making correct choices.

OBJECTIVES: In cooperation with local institutions in selected countries, the contractor is concerned with: (1) improving soil testing techniques and increasing laboratory capacities; (2) establishing or strengthening soil sampling and soil test reporting methods; (3) improving soil fertility research capability, and (4) developing data on crop responses to fertilizers for various soil groups and climatic zones.

PLAN OF WORK: A soil testing program was initiated, coupled with greenhouse and field studies, to correlate crop response. This required the development and use of standardized tests and improving the laboratory capability to handle large numbers of samples. The resulting data is being summarized and plotted on maps.

RESULTS: Currently all of the 14 cooperating countries have at least one modern laboratory equipped with multiple-unit apparatus capable of analyzing more than 100 samples per day. Brazil has 20 such laboratories. Soil fertility evaluation information is now used regularly in country fertilizer programs in Peru, Guatemala, Honduras, Nicaragua, Costa Rica, Brazil, and Bolivia, among others. Technical bulletins and other reports are issued in English, Spanish, and Portuguese. The project was completed in FY 1970. Its technical assistance aspects are being continued under a regional project sponsored and financed by the Latin America Bureau.

Research (Continued)

PROJECT NUMBER: B-20 (Started: 6/30/1969. Projected termination: 6/29/1974.)

TITLE: Soil Fertility Requirements to Attain Efficient Productivity on the Extensive, Deep, Well-drained by Relatively Infertile Acid Soils of the Humid Tropics

CONTRACTOR: Cornell University

PROBLEM: It has been estimated that there are more than two billion acres of uncultivated acid soils in the tropics which have high potential productivity. These soils are deep and well-drained and have good physical characteristics, but are relatively infertile for a variety of reasons. Most frequently they are low in nitrogen and phosphorous, are highly acid, may contain toxic amounts of aluminum, have a low base exchange capacity, and may have one or more micronutrient deficiencies. There is good evidence that they could be made highly productive at relatively little expense.

OBJECTIVE: To develop soil fertility aspects of soil use and management systems that will permit cultivators to realize the high potential of acid, infertile soils of the humid tropics for food production. The program also aims to provide some training as a by-product of the research and as a device for putting the results of the research into practice.

PLAN OF WORK: Based in Puerto Rico, the project is designed to have application over extensive areas in Latin America, Africa, and Asia. Complementary studies will be carried out in other tropical countries from the Puerto Rico base. Cornell University is collaborating with the University of Puerto Rico, U.S. Department of Agriculture, and other agencies in carrying out the project.

RESULTS: The work has been initiated in Puerto Rico and is being closely coordinated with other A.I.D.-sponsored soil projects.

PROJECT NUMBER: B-21 (Started: 7/1/1968. Projected termination: 6/30/1972.)

TITLE: Tailoring of Fertilizers for Rice

CONTRACTOR: Tennessee Valley Authority

PROBLEM: The need exists for fertilizers that are tailored specifically for rice, in order to enhance the efficiency of fertilizer use and improve the yield of rice per unit of applied fertilizer.

OBJECTIVE: Recent observations show that sulfur-containing coatings remain effective in paddy cultures in controlling the release rate of applied urea. This suggests that a mechanism of controlled release could reduce leaching losses and increase fertilizer use efficiency in rice production.

PLAN OF WORK: TVA is conducting on a worldwide scale tests of improved coatings, inhibitors, and products that will control the release and availability of applied nutrients for plant growth. Activities are concentrated on thorough testing for use in rice production in the less-developed countries. The work is being carried out at selected rice research centers (including the International Rice Research Institute in the Philippines) and is extended to other areas as results indicate.

RESULTS: The tests show that sulfur-coated urea, when used on paddy grown with good water control, is a satisfactory source of nitrogen but is not superior to regular urea or ammonium sulfate. TVA has evaluated rock phosphates on the basis of their citric acid available phosphate, and structure. When a representative series of these rock phosphates were used on acid paddy soils, the response of rice was closely correlated with the predicted availabilities. Thus certain types of rock phosphate may be satisfactory sources of phosphates for rice. Residual effects or carryover to subsequent crops is under study. Studies on sulfur-coated urea and/or rock phosphates have been initiated in the Philippines, India, Thailand, Ceylon, and Colombia. Trials will also be made in California and Louisiana.

PROJECT NUMBER: B-22. (Started: 7/1/1969. Projected termination: 12/31/1970.)

TITLE: Determination of Research Needs of Soils of the Tropics

CONTRACTOR: Agricultural Board, National Academy of Sciences

PROBLEM: There are more than four billion acres of potentially arable land in the world not under cultivation, about half of which is in the humid tropics. In addition, there are vast cultivated tropical areas where crop production is only a fraction of what should be feasible. Potentially arable lands in the tropics are uncultivated for a number of reasons, such as unfavorable geographic location, lack of markets and lack of knowledge of improved soil and crop management practices. In many of these undeveloped or poorly developed areas, soil infertility is a fundamental problem; however, ready responses to nitrogen, phosphate, and potassium have been noted. In other instances, the soil acidity is a factor limiting production. Deficiencies in other major essential mineral elements (magnesium, calcium, and sulfur) also have been identified. Minor element deficiencies (zinc, molybdenum, copper, etc.) may also be important. There are many other significant practical problems relating to the management of soils in the tropics which require additional knowledge for their solution.

OBJECTIVES: To utilize the expertise of the National Academy of Sciences Agricultural Board in organizing and carrying out a definitive study of high priority research needs relating to the soils of the tropics and their management. Specific research recommendations will be formulated.

PLAN OF WORK: The Agricultural Board of the National Academy of Sciences has selected a task force of 12 qualified soil scientists familiar with problems of the soils of the tropics. Research consultants are gathering from all available sources the most pertinent data available on soils of the tropics. When the consultants have completed their research, the task force will meet with them to discuss the findings and outline the final reports. A final conference will review the reports and prepare recommendations.

RESULTS: Work is in progress. Results are not yet available from the National Academy of Sciences.

PROJECT NUMBER: B-23 (Started: 1/1/1970. Projected termination: 6/30/1975.)

TITLE: Agronomic-Economic Research on Tropical Soils

CONTRACTOR: North Carolina State University

PROBLEM: There is a need for an economically sound procedure for making fertilizer recommendations from soil test analyses and crop response data.

OBJECTIVES: (1) To develop a methodology for an economically sound system of fertilizer recommendations derived from soil analysis and crop response data, and (2) to obtain basic soil fertility information and other data to better explain the response of crops to fertilizer applications and thus improve management practices.

PLAN OF WORK: This new project will be aimed primarily at Latin America, but results will be applicable to all developing countries in the tropics. The research will aim to explain the soil-fertilizer-crop response reactions of selected key soils of Latin American countries. All investigation will be carried out in cooperation with regional centers, host countries, local research institutions, and other A.I.D.-sponsored projects.

RESULTS: This research has just been initiated but will build on data developed by an earlier project with North Carolina State University, the continuing LA-NCSU soil evaluation contract, the A.I.D.-Cornell-Puerto Rico research study and other closely related studies.

Technical Assistance

PROJECT NUMBER: B-24 (Started: 11/16/1965. Projected termination: 6/30/1972.)

TITLE: Fertilizers, Technical Assistance

CONTRACTOR: Tennessee Valley Authority

PROBLEM: High-yielding cereal varieties are effective only when heavily fertilized. If their potential is to be adequately exploited, there must be increased and sustained growth in fertilizer use. In most of the LDCs there is a gap between fertilizer needs and utilization. A factor necessary to improve food production and diets of the LDCS is increased knowledge of fertilizer production, distribution, marketing, and use.

OBJECTIVES: This project is designed to aid in determining, assessing, and removing the gravest deficiencies in the LDCs' fertilizer programs. Specifically its aims are to: (1) ascertain world fertilizer capacity, production, and needs, and assess the impact of new agricultural technology on fertilizer demand in the LDCs; (2) investigate and analyze problems relative to procurement, transportation, and distribution of fertilizer exports to the LDCs; (3) establish and maintain a world fertilizer information service on production, marketing, distribution, and utilization; (4) evaluate basic raw materials such as marginal low-grade phosphate rock used in manufacturing fertilizers in the LDCs; (5) provide regional in-country training in fertilizer production, marketing, and utilization.

PLAN OF WORK: The central international fertilizer development staff of TVA responds to A.I.D. mission and country requests for technical assistance and research. Private industry, U.S. Department of Agriculture, land-grant universities, and financial institutions collaborate with TVA in the study of fertilizer needs and utilization in the LDCs.

RESULTS: TVA technical assistance has resulted in new and increased fertilizer plant capacities, new and improved marketing and distribution systems, new fertilizer intermediates, new and higher analysis materials, and improved application practices. New fertilizers, plus improved seed varieties, have boosted food crop production many-fold in the LDCs.

C. WATER MANAGEMENT

Research

PROJECT NUMBER: C-25 (Started: 6/28/1968. Projected termination: 6/28/1973.)

TITLE: Water management Research in Arid and Sub-humid Lands of the LDCs, LA

CONTRACTOR: Utah State University

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PROBLEM: Improvement of water management practices is essential to obtain maximum returns from limited water resources and such inputs as improved seeds and increased use of fertilizers and pesticides.

OBJECTIVE: To increase food production in the arid and sub-humid lands of Latin America through the improvement of water management practices.

PLAN OF WORK: The research under this contract is aimed at on-farm water management problems in the semi-arid lands of Latin America, but it will be applicable in principle to similar conditions in other regions. Research studies include: (1) development of data on the most efficient means of supplementing soil moisture by limited amounts of irrigation water; (2) development of data that can be used for the on-farm design and construction of inexpensive conveyance, delivery, and drainage systems; (3) development of management systems to minimize salinity hazards in irrigation waters of different qualities on soils of varying physical and chemical characteristics. The research is being closely coordinated with A.I.D.-sponsored projects on soils, fertilizers, and water with TVA, North Carolina State University, Cornell University, and Colorado State University.

RESULTS: A team made on-site investigations of water management research needs in El Salvador, Honduras, Colombia, Peru, Chile, and Brazil. Studies are under way in the areas of water rights; the role of improved irrigation and drainage in the economics of farm production; interactions between crops, fertilizers, and soil moisture; salinity controls, and water requirements of crops by areas.

PROJECT NUMBER: C-26 (Started: 6/28/1968. Projected termination: 6/28/1973.)

TITLE: Water Management Research in Arid and Sub-humid Lands of the LDCs, NESA

CONTRACTOR: Colorado State University

PROBLEM: The improvement of water management practices and the integration of these practices with other essential management and cultural procedures are basic to effective agricultural development.

OBJECTIVE: To increase food production in the arid and sub-humid lands of the Near East-South Asia region through the improvement of water management practices.

PLAN OF WORK: Research under this contract is centered on Pakistan, but the findings will be applicable to similar conditions in other countries in the Near East-South Asia region. A research team spent several weeks in Pakistan.

RESULTS: As a result of the team visit to Pakistan, a group of on-campus studies was initiated. These include: (1) skimming of fresh water from aquifers in which fresh water is underlain by saline; (2) economic analyses to achieve an efficient allocation of water in Pakistan; (3) evaluation of mineral-water iron equilibria that relate to water management practices; (4) optimization of the conveyance, delivery, and application of water to the farm. Research is being initiated in cooperation with local institutions. In addition to its on-campus studies, CSU will post two scientists in Pakistan. One man, an agricultural engineer, has already been posted in Lahore and field experiments initiated in cooperation with the Ayub Agricultural Experiment Station and West Pakistan Agricultural University.

D. PEST/DISEASE CONTROL

Research

PROJECT NUMBER: D-27 (Started: 6/30/1966. Projected termination: 6/30/1971.)

TITLE: Control of Weeds in the Less Developed Countries

CONTRACTOR: Oregon State University

PROBLEM: There is a need for simple, inexpensive, and effective methods of controlling weeds that can be used by farmers in the less developed countries. Some new crop varieties, such as the short-statured, high-yielding wheat and rice, require the strictest possible weed control in order to fully realize their productive potential. Furthermore, dense weed growths serve as focal points for important plant diseases, insect pests, and plant parasite nematodes. Weeds also compete with crops for available water, soil nutrients, and sunlight.

OBJECTIVES: To find effective, economical methods for controlling weeds in the LDCs. The research is designed to: (1) Identify the nature of the weed problems of the LDCs for each major ecological zone; (2) test known methods of weed control for their effectiveness; (3) develop improved or new control methods and improved adaptations of existing weed control methods; (4) train local technicians in weed control research and demonstration techniques, and (5) increase the weed control research capability of local institutions.

PLAN OF WORK: The contractor is: (a) searching relevant literature to catalogue and analyze the major problems of weed control in Latin America; (b) making a field study in Latin America to identify weed problems by species, extent, distribution, existing control measures, problems of control, and economic importance, and (c) evaluating, through on-site inspection, research institutions in designated countries to determine adequacy of facilities and research capability.

RESULTS: Research indicates that new materials can cut the current costs of effective weed control by as much as 50 percent. A draft weed research manual has been written and copies distributed to A.I.D. missions. Major emphasis to date has been in Colombia and Ecuador.

PROJECT NUMBER: D-28 (Started: 4/5/1967. Projected termination: 4/4/1972.)

TITLE: Control of Vertebrate Pests: Rats, Bats, and Birds

CONTRACTOR: Bureau of Sports Fisheries and Wildlife, U.S. Department of Interior

PROBLEM: Rodents, vampire bats, and noxious birds take a heavy toll of food supplies in the less-developed countries, and effective methods of controlling such damage have not been developed. Attempts to increase agricultural productivity without adequate protection of the products will be nullified by proportional increases in pest populations.

OBJECTIVE: To provide control methods that are safe, effective, economical, and adaptable to the social and economic conditions of the LDCs.

PLAN OF WORK: Laboratory investigations of existing chemical control agents are being conducted, including toxicological studies and evaluation of chemical repellents. Research includes designing and adapting electronic equipment such as radio-telemetry systems and automatic data-recording devices, and exploring the applications of radar, infrared, and other monitoring instruments. Existing theories and basic assumptions about pest population and control are being re-examined and new concepts developed.

RESULTS: General research is conducted at the BSFW's Wildlife Research Center at Denver, Colo. In addition, there are research stations in the field for each of the project's three components: at Los Banos, Philippines, for rat control; at Palo Alto, Mexico, for bat control; and at Palmira, Colombia, for bird control. Three annual reports recently were distributed to the USAID Missions--one on Vampire Bats, one on the Rodent Research Center, and one on the Denver Wildlife Research Center.

PROJECT NUMBER: D-29 (Started: 6/14/1963. Projected termination: 7/30/1974.)

TITLE: Research on Sterility Method of Tsetse Fly Control

CONTRACTOR: Agricultural Research Service, U.S. Department of Agriculture

PROBLEM: Through transmission of diseases to man and animals, tsetse fly infestations hamper cultivation of over 4,250,000 square miles of highly productive agricultural land in Africa.

OBJECTIVE: To find means of economically controlling or eliminating tsetse fly infestations through sterilization of the male species of this noxious insect.

PLAN OF WORK: Research is being carried out on tsetse fly attractants, reproduction behavior of colonized flies, breeding and population dynamics under field conditions, and investigation of small laboratory animals as sources of blood meals for colonized flies. A laboratory facility has been selected in Zambia and a full-scale field trial is being organized in conjunction with scientists of the United Nations Development Program, Food and Agriculture Organization and the Agricultural Research Council of Zambia.

RESULTS: Control of the tsetse fly by mass rearing and sterilization of males offers a potentially practical technique. In 1968 a major breakthrough occurred–the successful artificial rearing of one species of tsetse fly. This enabled the researchers to release appreciable numbers of sterile flies in field trials on two islands in Lake Kariba. Preliminary data showed a significant reduction in fly population on the islands.

PROJECT: D-30 (Started: 6/30/1968. Projected termination: 6/30/1973.)

TITLE: Research on Hemoprotozoal Diseases of Food-producing Livestock

CONTRACTOR: Texas A&M University

PROBLEM: Hemoprotozoal diseases are a major cause of low animal productivity in the less developed countries, with a consequent shrinkage of protein supplies available for adequate nutrition.

OBJECTIVE: To reduce hemoprotozoal diseases through preventive measures.

PLAN OF WORK: The contractor is: (1) developing methods for controlling hemoprotozoal disease by immunization or other preventive procedures; (2) determining ecological factors which contribute to the perpetuation of vectors and hemoprotozoal organisms in nature; (3) studying the interaction of certain hemoprotozoal organisms in relation to pathogenicity and immunity; (4) studying species resistance to certain specific hemoprotozoal organisms, and (5) training host country participants in research methodology and helping them organize problem-oriented research. Results of the research will have worldwide applicability.

RESULTS: Close working relations have been established with the Tropical Center of Agricultural Research (CIAT), at Palmira, Colombia. The Colombian government has made available a large tract of land for experiments, near the CIAT center. The promising research methods on protozoal organisms under way in Texas have been introduced in Colombia. Studies on the incidence of hemoprotozoal diseases in varying ecological zones have been completed. Treatment studies with chemotherapeutic agents have now been completed, so that clean cattle can be moved into vector-infested areas for immunity experiments. Experimental studies comparing the efficacy of vaccines are under way.

PROJECT NUMBER: D-31 (Started: 7/1/1970. Projected termination: 6/30/1971.)

TITLE: Laboratory and Field Testing of a Newly Developed Foot and Mouth Disease Vaccine for Potency, Viability and Immunity Duration

CONTRACTOR: National Academy of Sciences

PROBLEM: Foot and mouth disease is a limiting factor in the export of fresh or frozen meat from Latin America. This restriction on the meat trade seriously impairs the economy in major livestock-producing areas and substantially reduces the supplies of animal protein available to the local inhabitants. Vaccines currently in use protect animals against infection for only three to four months. Therefore, animals must be immunized at least three times a year -- at great cost to the livestock producer.

OBJECTIVE: Preliminary laboratory tests show that a newly developed adjuvant in vaccines produced by tissue-culture may confer durable immunity for as long as one year. If immunity against F.M.D. viruses of a year's duration can be determined, it will be possible to mount effective control and eradication programs in Latin America. There is now a need to measure these findings under field conditions and to subject experimental animals to exposure to virulent viruses.

PLAN OF WORK: Vaccines are produced at the U.S. Department of Agriculture's Plum Island Animal Disease Laboratory from virus strains provided by the Pan American Aftosa Center in Brazil. They are used for the field trials in susceptible animals at the Center and at a farm in an unaffected area in Argentina. Swine and sheep are used for the field trials at the aftosa center, where they are inoculated with virulent virus 30 days after vaccination and then at three, six, and nine-month intervals. A similar schedule is carried out on cattle at the Argentine test center.

RESULTS: There is concurrence among those who have reviewed the project that good results may be expected.

Technical Assistance

PROJECT NUMBER: D-32 (Started: 12/11/1964. Completed: 12/31/1969.)

TITLE: Manuals on Control of Plant and Animal Pests

CONTRACTOR: National Academy of Sciences

PROBLEM: The need exists for information on basic principles of plant and animal pest control to assist technicians of A.I.D. Missions and host countries in the preparation of research programs in this area.

OBJECTIVE: To provide A.I.D. Missions and host country institutions with scientific information having global applicability and not previously available in published form.

PLAN OF WORK: The National Academy of Sciences has prepared a series of six manuals dealing with various methods of pest control. These publications deal with basic principles only, mentioning specific pests only by way of illustration or in footnotes and without duplicating existing publications. The following subjects are dealt with: (1) Plant-Disease Development and Control; (2) Weed Control; (3) Insect-Pest Management and Control; (4) Control of Plant-Parasitic Nematodes; (5) Vertebrates Pests: Problems and Control; and (6) Effects of Pesticides on Fruit and Vegetable Physiology. The Manuals include material bearing on the problems of under-developed countries, with special reference to those in the tropics.

RESULTS: A.I.D. Missions have reported that the manuals are important references in host country institutions. Ceylon, Nigeria, Brazil, Tunisia, Pakistan, Jamaica, and the Philippines were among the reporting countries.

PROJECT NUMBER: D-33 (Started: 3/10/1966. Projected termination: 12/31/1970.)

TITLE: Textbook on Neotropical Phytopathology

CONTRACTOR: North Carolina State University

PROBLEM: Although plant diseases are much more common and severe in the tropics than in the temperate zones, far less scientific effort has been exerted in their identification, etiology, and epidemiology. The literature is not yet fully summarized and bibilographic sources are dispersed.

OBJECTIVE: To prepare a textbook-reference on neotropical plant diseases. The book is being prepared by Dr. F. L. Wellman, who spent 30 years in the tropics and sub-tropics performing research in neotropical phytopathology.

PLAN OF WORK: Dr. Wellman is summarizing the available Spanish, Portuguese, French, and English phytopathological literature and combining it with his own extensive research findings to provide a comprehensive reference work of some 600 pages. The university is preparing an associated smaller volume in which the known diseases of the American tropics are listed and indexed.

RESULTS: The manuscript is in the final stages and is expected to be delivered to A.I.D. this year. It is to be published commercially by Scarecrow Press, according to present plans, and copies distributed to interested USAID Missions.

E. FISHERIES

Research

PROJECT NUMBER: E-34 (Started 1/15/1967. Projected termination: Indefinite.

TITLE: Development of Conservation Processes for Fish Products Appropriate to Conditions in Developing Societies

CONTRACTOR: Agrarian University, La Molina, Lima, Peru

PROBLEM: One of the most critical nutritional problems in the developing countries is the inadequate protein content of many national diets. Fish and fish products represent a great potential for relieving protein malnutrition, but they are highly perishable -- particularly in the tropics. It is desirable to develop suitable processes for preserving this abundant food supply while retaining its palatability, so that a new and inexpensive source of protein may be brought within the grasp of millions now subsisting mainly on starchy foods.

OBJECTIVES: To devise new methods of preserving fish appropriate to Peruvian conditions and needs. (The project is specifically focused on the Peruvian fish-processing industry, but its implications are widely applicable in the less developed countries.)

PLAN OF WORK: The research is divided into three related and overlapping areas: (1) development and application of new processes of drying, salting, and smoking fish; (2) use of wood smoke to stabilize the residual oil in anchovy meal; (3) liquefaction of anchovies by fermentation and subsequent treatment to yield stable foods. The research is being conducted by staff members of the Department of Fish Technology, in the university's Faculty of Fisheries.

RESULTS: Started in 1968 as a two-year venture, the project got off to a slow start due to difficulty in purchasing needed equipment abroad. It was transferred to the Latin American bureau in 1969 and continued for another year. It is reported to be making encouraging progress in its study of new techniques to prevent spoilage; these would permit fish and fish products to be transported from the coastal regions of Peru to the altiplano, or interior highlands, where the need for more protein food is most acute.

Technical Assistance

PROJECT NUMBER: E-35 (Started: 7/1/1967. Projected termination: 6/30/1972.)

TITLE: Increased Fish Production Through Improved Fish Culture in the LDCs

CONTRACTOR: Auburn University

PROBLEM: The relatively low cost of fresh and brackish water fish protein production justifies the development of demonstration programs in fish culture techniques and research designed to increase yields.

OBJECTIVE: To meet the need for a cheap source of protein by improved fish culture.

PLAN OF WORK: The initial phase of the project was to identify fish culture activities in the less developed countries on a worldwide scale and to evaluate yield levels in comparison to potential capacities. The second phase deals with ways of increasing yields.

RESULTS: Auburn University, a world center of inland fish culture, has designated a staff of experts to respond to A.I.D. Mission requests for assistance in this field. Fish culture information has been collated for dissemination to A.I.D. Missions and interested countries. Training and demonstration facilities have been established at Auburn, and surveys have been completed on the Philippines, Thailand, Pakistan, India, Vietnam, and West Africa. Reports and recommendations for all the areas surveyed have been prepared. New feeding and disease control methods are being developed and new methods of fish rearing are being studied. Auburn staff members have participated in training seminars in Thailand and are assigned to a project in Brazil. It is anticipated that the level of activity will rise as the potentiality of the project for improving the nutritional quality of diets is recognized.

PROJECT NUMBER: E-36 (Started: 3/15/1968. Completed: 7/31/1970.)

TITLE: Fish Protein Concentrate (FPC) Market Feasibility Studies - Chile/Korea/ Morocco

CONTRACTOR: General Oceanology, Inc.

PROBLEM: Before a commercial FPC industry can be established, private investors and government planners require information on the supply of raw material, costs of production, magnitude of the markets, product development, etc.

OBJECTIVE: The primary objective of these studies is to: (1) answer the problem areas above, (2) provide information useful for investment decision-making, and (3) suggest ways to get the FPC-fortified foods into the food system.

PLAN OF WORK: The first contract for the Chile/Korea portion was awarded in FY 1969. Selection of a contractor for the Morocco project has been held up pending completion of plans for a parallel study in that country by the United Nations Industrial Development Organization (UNIDO). UNIDO would develop engineering and cost data for a small FPC plant in Morocco, while the A.I.D. feasibility study confined itself to marketing aspects.

RESULTS: The Korea final report concluded that erection of an FPC plant in Korea could not be economically justified, due to lack of raw material. The Chile report found that an FPC plant would be a good investment in Chile if the Chilean government committed itself to purchase a certain amount of the plant's product for use in its feeding programs.

PROJECT NUMBER: E-37 (Started: 3/15/1968. Completed: 11/26/1969.)

TITLE: Fish Protein Concentrate: (1) Purchase, (2) Inspection, (3) Evaluation

CONTRACTORS: (1) Alpine Marine Protein Industries, Inc.; (2) Bureau of Commercial Fisheries, U.S. Department of Interior; (3) University of California (Davis)

PROBLEM: An ordorless, tasteless powder derived from the solvent extraction of hake, Fish Protein Concentrate (FPC) is a promising potential source of cheap, high quality protein. A quantity of FPC was needed by A.I.D. for use as an additive in selected overseas feeding programs and for other demonstration purposes.

OBJECTIVE: The overall objective was to stimulate interest in FPC production in order to: (1) provide sufficient quantities of FPC for product development and large-scale acceptability trials; (2) provide a quantity of high protein for use in pre-school feeding programs, and (3) implement Section 218 of the Foreign Assistance Act (1968), which encouraged the expenditure of funds for FPC and other protein concentrates.

PLAN OF WORK: The three projects were developed as an integrated whole. A.I.D. contracted to buy 1,000 tons of specially-manufactured FPC from the Alpine firm. The Bureau of Commercial Fisheries was designated to inspect the plant and analyze the final product to assure conformity with contract specifications. The Univeristy of California (Davis) provided an interdisciplinary team of experts to collect and evaluate data on FPC's storage life and packaging requirements under various climatic conditions, as part of a general inquiry into its use potential in the less developed countries.

RESULTS: Of the 1,000 tons scheduled for delivery, only about 170 tons were adjudged acceptable under the contract by BCF inspectors. In November 1969 A.I.D. terminated the contract with Alpine for failure of the latter to deliver an acceptable product as scheduled. The acceptable quantity is being used by the California team in the evaluation researches which it will continue in Chile, Brazil, Nigeria, and Thailand until completion of that phase of the project in June 1971.

F. LAND TENURE

Research

PROJECT NUMBER: F-38 (Started: 4/15/1962. Completed: 6/30/1969.)

TITLE: Research and Training in Land Tenure and Reform in Latin America.

CONTRACTOR: University of Wisconsin

PROBLEM: In Latin America, about 80 percent of the farm land is owned by about 10 percent of the landholders. Maldistribution of land, labor, credit, technical information services, and other resources severely hinders agricultural development.

OBJECTIVES: This project provided for research in land tenure and reform in Latin America. Specifically, the research dealt with agricultural production as affected by kinds of land tenure and size of farm units; existing reform legislation and administration, and economic, social, and legal problems in holding and using land and water. The project also aimed at training U.S. and Latin American graduate students to be professionally competent in dealing with the issues of agrarian reform.

PLAN OF WORK: The project was carried out under the direction of the University of Wisconsin's Land Tenure Center at Madison, Wisconsin. The scope of the research covered the following areas: Farms (tenure, size, crops, inputs, productivity, income) in subsistence and larger-farm areas; farm labor (conditions of employment, wages, income); cooperative or profit-sharing plans; availability and use of government services to farmers; communication of technical information; population growth and migration; local government; land taxes; legal basis and use of water rights; financing of agrarian reform; land titles and registration, and land tenure or agrarian reform legislation and administration.

RESULTS: Research was conducted in 11 Latin American countries in cooperation with local universities, research institutes, or government agencies. The Land Tenure Center published more than 125 research reports and papers and provided training and research experience to around 300 students, half of them from Latin American or other less developed countries.

G. FACTOR ANALYSIS-PLANNING

Research

PROJECT NUMBER: G-39 (Started: 6/1/1963. Completed: 6/30/1970.)

TITLE: Analysis of Factors Associated with Differences and Changes in Agricultural Production in Less-Developed Countries

CONTRACTOR: Economic Research Service, U.S. Department of Agriculture

PROBLEM: Reliable guidelines are needed for increasing agricultural productivity in the less-developed countries, based on analyses of data to: (1) determine differences among countries in rates of progress in improving agriculture; (2) identify those factors most commonly associated with higher rates of increase in output and productivity; (3) develop alternative approaches to agricultural development of less-developed countries through economic and technical assistance, and (4) analyze the processes by which less-developed countries make the transition from low to higher levels of agricultural output and productivity.

OBJECTIVE: To determine the needed guidelines for increasing agricultural productivity in the LDCs.

PLAN OF WORK: First, a comparative analysis was made of changes in agricultural output and productivity and of the technological, economic, and institutional conditions associated with these changes for 26 countries. Next, detailed studies were made of changes in agricultural output and factors affecting these changes in seven countries: Taiwan, Greece, Mexico, Brazil, Colombia, Nigeria, and India. Finally, a report on significant factors contributing to increasing agricultural output was completed.

RESULTS: Initial findings were reported in the volume "Changes in Agriculture in 26 Developing Nations, 1948-1963." Wide distribution was made to USAID Missions and cooperating agencies overseas, with a printing of 12,000 copies. For host country institutions in Latin America and Africa, Spanish and French versions were issued. Several other reports have been submitted under the contract, and given similar distribution including the final report, "Economic Progress of Agriculture in the Developing Nations."

PROJECT NUMBER: G-40 (Started 10/1/1966. Terminated: 12/31/1969.)

TITLE: Factor Analysis for Accelerating Agricultural Productivity in Less Developed Countries (Mexico)

CONTRACTOR: International Marketing Institute, Cambridge, Mass.

PROBLEM: Resources of the private investor must be tapped if the all-out attack on world hunger is to be successful. It is important to determine why agriculture, in the face of demonstrated opportunity for marked increases in production, does not attract more outside investment. Observers believe that one reason is the fear of many farmers in the less developed countries to accept the risks involved in making technological change.

OBJECTIVE: The project aimed at investigating the economic, social and political factors inhibiting the adaptation of proven agricultural practices in traditional agricultural societies.

PLAN OF WORK: From a base in Guadalajara, Mexico, the contractor worked out a method for analyzing projects which have shown an inherent capability to attract private investment capital into agriculture in the LDCs.

RESULTS: The contractor provided A.I.D. with analytical reports on the research and a final report designed to assist in the setting up of pilot projects for building institutions that utilize technology and encourage investments from the indigenous private sector. Copies of the reports were distributed to organizations interested in private sector efforts toward agricultural development in the less developed countries.

PROJECT NUMBER: G-41 (Started: 6/30/1967. Projected termination: 3/31/1971.)

TITLE: Rural Development Analysis (Agricultural Sector Planning Models)

CONTRACTOR: Michigan State University

PROBLEM: Regional bureaus, country missions, and several U.S. foundations have expressed the need for simulation models which will prove useful to policy- and decision-makers in formulating programs and projects to improve the productivity of agriculture in the less developed countries.

OBJECTIVES: This project is designed to analyze the agricultural activities of a region or country to identify situations or conditions that limit efficient functioning and development. Efforts are directed at developing simulation models applicable to development environments in countries being assisted by A.I.D.

PLAN OF WORK: The contractor is producing plans for the development of operational research models to assist policy- and decision-makers concerned with problems involving agricultural research, agricultural education, investments in crop and livestock production and in agricultural infrastructure.

RESULTS: Preliminary models of the Nigerian beef industry and the Nigerian agricultural economy have been developed. The models being developed are expected to assist U.S. and LDC policy- and decision-makers in planning country projects in the future.

PROJECT NUMBER: G-42 (Started: 12/10/1964. Terminated: 12/31/1968.)

TITLE: Diffusion of Innovations in Rural Societies

CONTRACTOR: Michigan State University

PROBLEM: Many farmers in the less developed countries lack the knowledge and skills to transform their farming operations from production for subsistence to production for market. It is desirable to know how technical farming information is disseminated among farmers and how effectively it reaches them.

OBJECTIVES: The purpose of this research was to obtain a better understanding of how the process of adoption of innovations occurs in agriculture, and the main factors which hinder further adoption of improved technology.

PLAN OF WORK: The research was conducted in Brazil, Nigeria, and India in a three-phase sequence: (1) Using the agricultural village as a basic unit of study, the research attempted to measure the levels of agricultural innovation adoption among villagers, and to relate the village adoption indexes with measures of access and use of communications media, size of village, size of farm, land tenure, social class, leadership patterns, kinship groups, and other village, farm or external characteristics; (2) based on this data obtained from farmers, research was directed toward measuring adoption of agricultural innovations at the farm level, and relating the adoption indexes to personal characteristics of farmers, farm size and efficiency, social participation, knowledge and use of communications media, etc; (3) in selected villages of each country, experimentally-designed incentives for adoption of farming practices were carried out with different communications channels or techniques.

RESULTS: Reports have been prepared on each phase of the project in each country of study. The research reports on India have been widely circulated, requiring additional printings. The final report, to be used as a manual for field workers responsible for introducing new technology to farmers, has not been completed.

PROJECT NUMBER: G-43 (Started: 6/30/1970. Projected termination: 6/30/1973.)

TITLE: The Impact of New Technology on Rural Employment and Income

CONTRACTOR: Cornell University

PROBLEM: Successes with the new high-yielding grain varieties are creating income disparities in some developing countries. In general, the landless labor class has benefited least from the new agricultural technology. Consequent social and political tensions may threaten continuance of economic policies fostering the further expansion of agricultural production.

OBJECTIVES: (1) To determine how new technology affects the employment opportunities and income of rural people, and (2) to make policy recommendations designed to accelerate technological changes and productive growth and eliminate forces which impede these desirable policy goals.

PLAN OF WORK: This new project will be divided into three main parts: (1) a series of studies of the relationship between agricultural infrastructure, the diffusion of new technologies, and the growth and income distribution effects of agricultural development; (2) a series of farm level descriptive studies of the effect of agricultural growth on the distribution of income, and (3) a theoretical model for analysis of relationships between economic growth and income distribution.

RESULTS: Findings from this research will be coordinated with those from the recently completed Cornell project on the role of agricultural prices in economic development (see Project Number I-46) and other allied studies relating to rural income and employment.

H. AGRICULTURAL FINANCING

Research

PROJECT NUMBER: H-44 (Started: 6/28/1968. Terminated: 9/30/1969.)

TITLE: Analysis of Agricultural Capital Formation and Utilization in Less Developed Countries

CONTRACTOR: Ohio State University

PROBLEM: The use of agricultural credit as a tool to accelerate farm production has not been satisfactory in most of the LDCs. It has been established that credit can speed farm production only if the country's economy as a whole is functioning smoothly and adequate resources are available to develop those economic, social, political, and institutional factors which, if neglected, could impede development in the agricultural sector.

OBJECTIVE: To analyze the principles of agricultural capital formation and utilization in four selected LDCs (Brazil, Colombia, Ecuador, and Peru). The goal of the studies was to indicate where credit has been utilized most advantageously, by size of farm, type of farm enterprise, and management level, so that policy-makers may be guided in allocating credit to the most effective and efficient uses.

PLAN OF WORK: The contractor's researches were primarily concerned with: (1) input-output relationships, i.e., production functions determing the productivity of capital; (2) identification of factors and production practices that change the rate of returns to capital; (3) identification of the factors limiting the use of credit, such as inputs, storage, markets, roads, as well as credit and other incentives.

RESULTS: A final report was submitted which summarized the findings and conclusions. Value of the data is dependent upon the use to which it is put by policy-makers. The material is being exploited further in a related project by the same contractor (see following page).

PROJECT NUMBER: H-45 (Started: 6/30/1969. Project termination: 6/29/1971.)

TITLE: Analysis of Capital Formation and Technological Innovation at the Farm Level in LDCs

CONTRACTOR: Ohio State University

PROBLEM: Lack of capital is a major curb on agricultural development. Major increases in agricultural productivity require increases in capital investment to finance the farmer's adoption of new technology. The supply of capital for sustained increases in agricultural investment must come internally from sustained increases in internal capital formation; this, in turn, must derive from increased productivity.

OBJECTIVES: This research project grows out of the foregoing one. It analyzes how capital is formed and utilized at the farm level, how technological innovation is related to the process, and how government policies and programs act as incentives or inhibitors to capital formation. Primary target is the development of general analytical methods for measuring the effect of capital formation and technological change on the developmental process. The research aims to identify the factors that result in accelerated capital formation, increased farm income, and economic development.

PLAN OF WORK: Research is conducted at two interrelated levels: a general analysis model and a series of farm level studies. The latter, beginning in southern Brazil, attempt to identify how the production-income-growth process is affected by four sets of forces: resources, income allocation, internal forces, and external forces. The analysis model will interpret results of the farm level studies for policy implications. The necessary basic studies and a preliminary testing of the model will be completed within a two-year period.

RESULTS: Field researches were delayed in getting under way; thus, it is too early to evaluate results.

I. AGRICULTURAL PRICING

Research

PROJECT NUMBER: I-46 (Started: 6/30/1966. Completed: 6/30/1970.)

TITLE: Agricultural Prices in Economic Development, Their Role, Function, and Operation

CONTRACTOR: Cornell University

PROBLEM: The importance of agricultural prices in determining the pattern and rate of economic growth has been imperfectly understood in the less developed countries. This is due in part to a failure to understand the multiple role which prices may play in the process whereby a society changes from predominantly agricultural to predominantly urban.

OBJECTIVE: To conduct studies on (1) the management of pricing systems and (2) the influence of pricing on the consumer and on income and capital transfers between the agricultural and non-agricultural sectors.

PLAN OF WORK: Research was concentrated in India, Pakistan, Nepal, Thailand, and Taiwan. Typical of the studies was one on the vegetable market in Taiwan to determine: (a) size of margins in vegetable marketing; (b) impact of these margins on production volume and geographic pattern of production, and (c) effect of changes in technology on marketing production.

RESULTS: The preliminary result of the contractor's work in India has played a part in the determination of the price support program of the government of India. Assistance provided the A.I.D. Mission in Nepal has contributed to the rapid acceptance of the importance of agricultural inputs, agricultural prices, and storage and marketing in developing the agricultural sector of Nepal.

J. MARKETING

Research

PROJECT NUMBER: J-47 (Started: 6/1/1963. Completed: 6/30/1970.)

TITLE: Analysis of Demand Prospects for Agricultural Exports of Less Developed Countries

CONTRACTOR: Economic Research Service, U.S. Department of Agriculture

PROBLEM: A need exists to have an indication of world demand for major export commodities, together with demand and supply projections over a significant time period. Such data would be of value in the formulation of agricultural plans for the less developed countries and more particularly for the proper allocation of their limited resources. The information is also needed to guide LDCs in their efforts to earn foreign exchange by marketing agricultural products.

OBJECTIVE: To ascertain future commodity demand prospects for agricultural export products of the LDCs.

PLAN OF WORK: The scope of work included analysis of 26 individual commodities or commodity groups, including coffee, cocoa, bananas, oilseeds, rice, wheat, feed grains, cotton, sugar, and selected fruits and vegetables. The commodity analysis covers production, consumption, price, and world trade patterns for the period 1951-1965.

RESULTS: Nine reports have been issued, including a group of statistical studies on world trade.

PROJECT NUMBER: J-48 (Started: 7/28/1965. Terminated: 6/30/1969.)

TITLE: Farm Marketing Facilities and Practices in Tropical Africa

CONTRACTOR: Stanford Research Institute

PROBLEM: Agricultural marketing systems are generally primitive in the less developed countries, with a minimum of grading, processing, financing, and storage facilities. Wide price fluctuations seasonally and geographically are harmful to both producers and consumers, and middlemen are suspected of earning high profits at the expense of both.

OBJECTIVE: To identify practical means for enhancing the efficiency with which foodstuffs are marketed in tropical Africa.

PLAN OF WORK: The research was conducted in four areas of three countries—Western Nigeria, Eastern Nigeria, Sierra Leone, and Kenya—with assistance of sub-contractors and cooperating host institutions. One American and one African agricultural economist made up the research team in each area. Data were collected from interviews with farmers, truckers, millers, wholesalers, retailers, consumers, and marketing officials. Information included all aspects of the marketing process relating to domestically-consumed staple food crops: supply, demand, prices, grades or standards, transportation, credit, taxes, licenses, processing, storage, arbitrage, risk-bearing, volume of business, costs of operations, and profits.

RESULTS: Reports were issued for each area studied. A final report, "Marketing of Staple Food Crops in Tropical Africa: Overall Analysis and Report," summarizes and synthesizes the findings. The research indicated genuine need to improve farmers' production incentives in a number of respects. This and other research underscores the fact that farmers in developing countries are responsive to adequate production incentives. African farmers can produce more food if there is an effective demand.

Technical Assistance

PROJECT NUMBER: J-49 (Started: 5/17/1970. Projected termination: 6/30/1972.)

TITLE: Technical Assistance for Food Marketing

CONTRACTOR: Foreign Economic Development Service, U.S. Department of Agriculture

PROBLEM: The "Green Revolution" has brought a syndrome of new problems in its train. Disruption of traditional marketing systems has occurred in a number of developing countries whose farmers have adopted high-yield grain varieties and innovative agricultural technology. It is becoming obvious that if increased crop production is to be sustained and agriculture is to contribute its full potential to overall development, more expertise and resources must be focused on improving the marketing of food in the less developed countries. If the farmer's crops do not move to market or return him a higher income, he will have little incentive to increase production. Similarly, if the marketing system does not provide food to consumers when they need it and at prices they can afford, higher production will have little effect in alleviating world hunger.

OBJECTIVES: This project aims to help A.I.D. Missions, host governments, and agribusiness groups in selected countries to identify critical marketing problems inhibiting agricultural growth and formulate means for dealing with such problems. It will provide technical assistance on request to help in resolving such marketing problems as poor distribution facilities; shortcomings of procurement and processing; aberrations of supply, demand, prices, etc.

PLAN OF WORK: In the beginning the priority concern will be with marketing problems of the basic grains—rice, wheat, corn—in which rapid increases in production have taken place in some countries. These crops provide a livelihood for most of the small farmers in the LDCs; hence, marketing factors constraining their growth have a wide "ripple effect" on overall economic development. Later, other basic food crops such as pulses, feed grains, etc., will be included. Seminars will be held at which A.I.D. and participating country personnel will discuss findings, exchange ideas, and plan methodology and technique.

RESULTS: It is too early to report results of this new project.

K. A.I.D.–UNIVERSITY PROGRAMS IN AGRICULTURAL EDUCATION

Research

PROJECT NUMBER: K-50 (Started: 6/25/1965. Completed: 6/30/1969.)

TITLE: Analytical Study of A.I.D./University Programs in Agricultural Education and Research

CONTRACTOR: Purdue Research Foundation

PROBLEM: A.I.D. has actively encouraged the development of institutions for agricultural education and research in the less-developed countries through the financing of technical assistance contracts with U.S. universities. There were many informed opinions regarding the factors which influence the effectiveness of such projects but little tested evidence on which factors influence project effectiveness under varying circumstances.

OBJECTIVES: The specific purposes of this project were to: (1) formulate significant principles of broad applicability to serve as guidelines for program planning and operations; (2) assess what has been accomplished by the program for developing agricultural education and research institutions abroad and the cost of such development; (3) establish criteria of progress in institutional development which can serve as guidelines for A.I.D., the U.S. university community, and the cooperating countries, and (4) indicate other types of rural development assistance for which the capabilities of U.S. land-grant and other universities could be employed advantageously.

PLAN OF WORK: Staff collected and analyzed data on operations and results of A.I.D.-University projects in agricultural education and research in developing countries; effects of such projects on host countries; factors influencing the effectiveness of university contracts for conveying technical assistance, and effects on U.S. universities of the A.I.D.-University contract system. Nine universities conducted the research in host countries and in the United States.

RESULTS: Nineteen research reports and papers have been published on various phases of the A.I.D.-University projects and steps needed to further strengthen the role of both U.S. and host country universities in accelerating agricultural development through training, research, and extension.

PROJECT NUMBER: K-51 (Started: 4/23/1970. Projected termination: 4/23/1971.)

TITLE: Asian Agricultural College and University Seminar

CONTRACTOR: North Carolina State University

PROBLEM: In recent years many Asian nations have achieved appreciable progress in building colleges, universities, and related institutions to serve the needs of their growing agricultural industry. But opportunities have been few for the leaders of such institutions to exchange ideas in personal contact and study at first hand the institution-building experience of other nations in the region.

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OBJECTIVES: This project was designed to offer such an opportunity by means of a "traveling seminar" in which a group of Asian educators would be invited to visit a few representative agricultural universities in several countries of the region and hold discussions with administrators, faculty, and students on how these institutions have developed in response to the needs and problems of the areas they serve.

PLAN OF WORK: The contractor organized and conducted the seminar, which was held from September 20 to October 10, 1970. The group, comprising some 40 educators and observers from the Philippines, Japan, Malaysia, Indonesia, and other countries, visited agricultural universities in Thailand and India. Discussions ranged over the instructional, training, research, and extension functions of agricultural universities; their role in agricultural development, and the problems encountered in developing such institutions. Representatives of UNESCO and FAO attended the sessions.

RESULTS: It is difficult to measure precisely the results of a project so fraught with intangibles, but it can be assumed that the participants experienced a broadening of perspective and enrichment of background from the personal exchanges and observations. The contractor is preparing a report on the proceedings.

PROJECT NUMBER: K-52 (Started: 6/30/69. Completed: 6/30/70.)

TITLE: CIC-AID 1969 Summer Workshop and Seminar on Agricultural College and University Development

CONTRACTOR: Purdue University

PROBLEM: Development specialists in the governmental and academic worlds agreed that there was an inadequacy of research and information on the institution-building process in the less developed countries.

OBJECTIVES: To extend our knowledge of institution-building in general, and to examine the role of the agricultural college and university in the LDCs in particular.

PLAN OF WORK: The proposal to hold the workshop and seminar was submitted by the Committee on Institutional Cooperation, a body representing a consortium of Midwest universities. It was reasoned that knowledge of the process of institution-building in the developing nations would be furthered by bringing together for a discussion U.S. university team leaders, A.I.D. mission personnel, representatives of host country nations, and academic workers in the field of international programs. The workshop and seminar were held on the campus of Purdue University from July 28 to August 15, 1969, under the auspices of the International Programs Division of Purdue's School of Agriculture. Some 50 participants from 10 countries attended.

RESULTS: A summary report was prepared, including recommendations of interest to A.I.D., U.S. universities, and agricultural colleges and universities in the LDCs.

L. GENERAL ASSISTANCE TO AGRICULTURE

Technical Assistance

PROJECT NUMBER: L-53 (Started: 9/14/1967. Projected termination: 8/31/1973.)

TITLE: Joint FAO/US Training Program on the 1970 World Census of Agriculture

CONTRACTOR: Bureau of the Census, U.S. Department of Commerce

PROBLEM: Statistical information obtained through agricultural censuses is crucially important in promoting food production. In fact, it is very difficult to plan a realistic program or adequately appraise progress without meaningful statistics. The Food and Agriculture Organization is promoting a 1970 World Census of Agriculture. Most of the countries that are members of FAO are undertaking an agriculture census between 1969 and 1972. A.I.D. is vitally interested in these censuses because of their potential as a useful source of information. A.I.D. is therefore jointly sponsoring this project for training foreign census takers and administrators of census projects.

OBJECTIVES: To strengthen, improve, and standardize the collection and publication of statistical data in developing countries where statistical and census deficiencies must be overcome. Trained census takers returning to their respective countries will help devise methods through which information will be obtained on the structure, production, and productive capacity of the agricultural sector. Census results will also be used in planning social and economic development programs, apportioning government funds, and providing a factual basis for legislation concerned with agriculture.

PLAN OF WORK: Most of the foreign participants are sponsored through the A.I.D. participant training program and the FAO fellowship program. The Bureau of the Census of the U.S. Department of Commerce provides professional personnel to conduct special training and workshops in agricultural census planning and execution. Base of the year-long census training program is at the U.S. Department of Agriculture and the Bureau of the Census headquarters at Suitland, Md.

RESULTS: It is estimated that a total of 200 participants from 75 countries will receive their training in the U.S. under this project.

PROJECT NUMBER: L-54 (Started: FY 1965. Projected termination: Indefinite.)

TITLE: Agricultural Technical Support (Technical Literature)

CONTRACTORS: Various (U.S. Department of Agriculture, University of Florida, National Academy of Sciences, Volunteers for International Technical Assistance, Inc., and others)

PROBLEM: The project was originated to meet the needs of A.I.D.'s multifarious technical information activities in agriculture. It was necessary to improve the technical inquiries service to the A.I.D. Missions by providing them with copies of current textbooks and development literature, developing and publishing new publications, and revising and reprinting existing ones.

OBJECTIVES: The project serves as a technical information backstop in that it makes funds available to purchase publications required to answer a specific inquiry or to develop information not yet in published form. It provides the means to purchase, print, or reprint research and technical assistance reports and also encourages the publishing of commercial editions of A.I.D.-sponsored reports.

PLAN OF WORK: The project operates in four main information areas: (1) the technical inquiries service, (2) information flow to the A.I.D. Missions, (3) development of new materials, and (4) translation programs.

RESULTS: The writing, editing, printing, revising, translating, and/or reprinting of numerous publications have been made possible through this project. These publications are used both worldwide in the English language and translated versions and in the U.S. by universities and government agencies. In many instances they have become the prime sources of information on the processes of research and technical assistance in the developing countries. Among them are the "Handbook of Tropical and Sub-tropical Horticulture," "The Sprinkler Irrigation Guidebook," and the "Village Technology Handbook."

M. INSTITUTIONAL GRANTS PROGRAM

Section 211(d) of the Foreign Assistance Act of 1966 authorizes grants to U.S. educational and research institutions for the purpose of building competence and expertise in selected areas related to international development problems. Following are 211(d) grants in the field of agriculture and fisheries, currently in effect for five years each:

Institution	Effective Date	Purpose
1. Council of U.S. Universities for Rural and Agricultural Development in India:		
a. Univ. of Illinois	5/31/1968	Study and control of crop disease
b. Kansas State Univ.	"	Grain Storage, Handling, etc.
c. Univ. of Missouri	"	Crop Breeding
d. Ohio State Univ.	"	Soil Fertility
e. Penna. State Univ.	"	Seed Production
f. Univ. of Tennessee	"	Agricultural Economics, Sociology
2. University of Wisconsin	4/28/1969	Land Tenure in LDCs
3. Council of U.S. Universities for Soil and Water Development in Arid and Sub-humid Areas:		
a. Univ. of Arizona	5/23/1969	Watershed management
b. Colorado State Univ.	"	Water delivery, removal systems
c. Utah State Univ.	"	On-farm management of water

Institution	Effective Date	Purpose
4. University of Minnesota	6/24/1970	Agricultural policy planning
5. Consortium of universities to provide staff support in agricultural economics:		
a. Iowa State Univ.	6/24/1970	Mobilization of staff support to AID in agricultural economics
b. Cornell Univ.	"	"
c. Michigan State Univ.	"	"
6. Consortium of universities with special capability in tropical soil science:		
a. Prairie View A & M	6/30/1970	Soils science, with emphasis on savanna & prairie ecology
b. Cornell University	"	"
c. North Carolina State Univ.	To be funded in FY71	"
d. University of Hawaii	"	"
e. University of Puerto Rico	"	"
7. University of Rhode Island	5/7/1969	Utilization of marine resources
8. Auburn University	6/24/1970	International aquaculture

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